

# WATERSHED AND HYDROLOGIC CONDITION ANALYSIS

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**Abstract.** Watershed and hydrologic condition analysis (WHCA) is another methodology for analyzing impacts of variable flow and associated pollutants on a watershed. (USDA, 1997.) The WHCA process complements the 6 elements and three general steps for watershed analysis and provides the logical basis for TMDL development process that are dominated by nonpoint source contributions.

The WHCA provides a logical process for examining the impacts of variable flow from a watershed and the nonpoint pollutants associated with variable flow on the receiving water body. The WHCA (1) determines the important factors that influence watershed activities and (2) provides information to select an evaluation and modeling approach and provide a sound decision making rationale. To understand the movement of nonpoint pollutants in a watershed and their subsequent loading to a water body, the analyst has to understand the overland transport processes, the flow characteristics, and any other aspect that influences flow and timing of water in the watershed. WHCA results in an understanding of the meteorological, surface, overland flow and ground water, physical and biological factors and pollution sources that influence water flow, quality and timing (USDA, 1997).

The WHCA provides a methodology that focuses on the factors that most directly changes of flow, quality and timing of the water in a watershed. By understanding the major factors affecting the watershed, a determination can be made of what type of methodology should be used to evaluate flow and pollutant impacts on the waterbody and what management activities can be implemented to positively affect the flow and quality of the watershed.

**The WHCA Process.** The analysis steps provide the basis for supporting professional judgment and for developing credible conclusions and management alternatives.

**Step 1:** Characterize the watershed. Briefly describe the dominant meteorological, over land flow, surface water, ground water, physical and biological factors and pollution source in the watershed. Develop a case file of the watershed, documenting all the available knowledge of the watershed characteristics. Identify numeric and/or narrative standards or criteria that are not being maintained. Appendix A provides a case example for WHCA steps 1 - 5.

**Step 2:** Rate the relative importance of the factors used in Step 1. Document each factors potential to influence flow, quality or timing (F, Q, T) by rating its importance using a rating scale of

"high," "moderate," or "slight/none." This rating is subjective. It is accomplished by using professional judgment and knowledge of the physical and biological systems within the watershed. This rating helps the analyst narrow down factors affecting water movement to those which are the most important.

**Step 3:** Identify specific factors needed to determine the watershed and hydrologic analysis.

**Step 4:** Describe current status of the factors selected.

**Step 5:** Describe the water quality criteria and the reference levels of the selected factors. The water quality criteria can be derived from the State's WQS or the EPA criteria documents, and in some cases is developed by the consensus of experts' opinions.

In order to determine the rate, direction or magnitude of change, a reference level or condition must be established. Reference level serve as a benchmark from which change is determined and serve as a basis for comparison. A reference level could be an unimpacted watershed condition or existing standards or criteria. A reference level is to explain changes in selected factors over time as the result of human influence or natural disturbances.

**Step 6:** Determine a watershed evaluation process (e.g. a water quantity and quality model) that incorporates all the major factors identified in Steps 2 and 3. Appendix B provides a discussion on the various water quality and quantity analytical methodologies and the various water quality models available.

**Step 7:** Evaluate the causes of the changes from reference conditions or existing standards or criteria. Determine the factors affecting the change. Project the potential for recovery of the watershed or determine if the changes resulted from natural events or past human activities that have altered the hydrologic functions and / or the water quality of the watershed.

**Step 8:** Develop the TMDL for the pollutants of concern and identify the related management activities necessary to implement the TMDL. Note where the watershed is altered in such a way that management activities will have little or no impact on the changes in the watershed. If standards violations are still present, site specific standards may be necessary.

**Step 9:** Monitor to gather additional data and/or monitor to determine effectiveness of the management strategies. Appendix C provides detailed information on the various monitoring approaches.

## LITERATURE CITED

USDA-Forest Service, USDI-Bureau of Land Management, "A Framework for Analyzing the Hydrologic Condition of Watersheds", February, 1997.